Exhibit A

Planning Non-Line-of-Sight Wireless Backhaul Networks

WHITEPAPER

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Introduction

Small Cell base stations (SCBS) are widely recognized as a solution to the insatiable demand for mobile data traffic which has been about doubling every year. Mobile traffic is expected to reach 10.8 exabytes per month in 2016 from 0.6 exabytes per month in 2011[1]. The macro-cellular architecture where base station antennas are mounted on building rooftops has served the purpose of providing mobile voice service very well. However, the advent of mobile data services has exposed weaknesses in the macro-cellular architecture specifically on supporting acceptable levels of service and performance for non-evenly distributed traffic. Small cell base stations are used to solve the 'capacity hotspot' problem where there is a high level of subscribers concentrated in one location competing for limited service resources resulting in poor performance to all users. Small cells are also used to solve the 'coverage hole' problem where poor signal quality results in poor or no service.

Adoption of small cells and their deployment in large numbers are subject to resolving a few challenges, of which one of the most prominent is backhaul. Current backhaul solutions such as optical fiber or line-of-sight (LOS) microwave systems used for macro-cells don't scale for small cells. Aside from technical limitations of some technologies, the fundamental challenge is that of cost: small cell backhaul has to be very cost effective for the entire business case for small cell deployments to be widely adopted.

This white paper provides an overview of the planning and design of Non-line-of-sight (NLOS) wireless backhaul systems. NLOS systems can be deployed anywhere very quickly and as a result provide a very cost effective solution both in terms of capital and operational expenditures than current wireless and wireline solutions that are significantly more expensive.

The Benefits of Small Cell Base Stations

Small cell base stations are deployed low above ground (e.g. 3-5 m) and in close proximity to the mobile subscriber which results in superior performance over macro cells that are deployed high above ground and cover relatively large areas (typically around 300-500 m radius in urban areas). Capacity is injected into the network by adding SCBS in key locations where a gathering of mobile users drive traffic demand in a small area. This serves the additional purpose of off-loading traffic from the large macro cell covering the area.

Another use case for small cell base stations is to enhance cell edge performance. Macro cells exhibit poor performance at the cell edge: LTE was designed to provide about 0.04 – 0.06 bps/Hz/user at cell edge in the downlink, and about half that in the uplink. In comparison, this is 2-3 times better than 3G cell-edge spectral efficiency. Hence, small cells will be deployed in greater numbers at the cell edge to improve user performance especially as a cell edge user may use a disproportionate amount of base station resources. Table 1 shows the distribution of performance in a typical 4G wireless macro-cell in urban area. The maximum cell range operates at the lowest modulation coding scheme which provides the highest resiliency and robustness to errors. The area of a cell that operates on this modulation rate

[1] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011–2016.

is 40% of the total cell size. Hence, if we assume uniform subscriber distribution, a very large percentage of users can only be served at the lowest performance level.

Table 1 Performance distribution in a wireless cell.

Modulation	Spectral Efficiency (b/s/Hz)	Cell Radius (m)	Area (Sq. Km)	% Area
QPSK1/2	1	610	0.39	40%
16QAM1/2	2	472	0.31	33%
64QAM2/3	4	319	0.26	27%
Total			0.97	100%

Small cell base stations offer considerable advantage to inject capacity in a wireless network. To illustrate this, Figure 1 shows a simulation whereby 2 and 4 small base stations with 1 W output power deployed in the coverage area of a macro-cell with 250 meter cell radius. The total downlink capacity increases by 100% and 173% over that of a single sector with 2 and 4 small base stations, respectively[2].

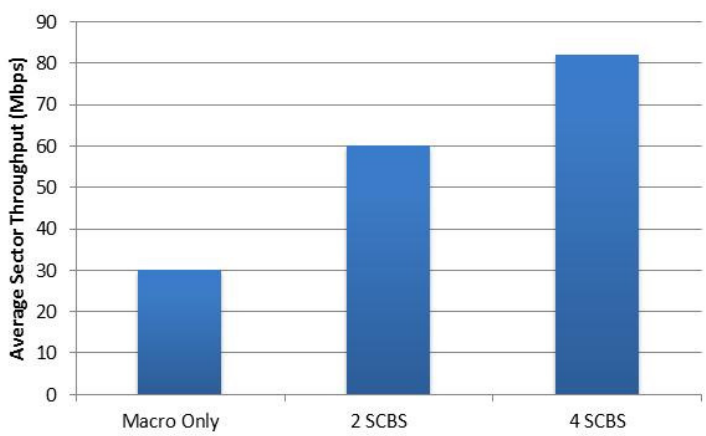


Figure 1 Aggregate downlink sector throughput for 0/2/4 small cell base stations per macro-cell sector.

Small cell base stations are not the only solution to address the explosive demand for capacity. WiFi offload is another example. When deployed outdoors, WiFi offload nodes will also require backhaul. NLOS backhaul solutions can be used in this case in the same way as they are used to backhaul small cell base stations.

[2] The results are part of a more comprehensive study of small cell performance by Yuhan Zhou and Professor Wei Yu at the Department of Electrical Engineering, University of Toronto and sponsored in part by BLiNQ Networks.

Overview of Cost of Backhaul Systems

Small cell base stations are a real solution to the capacity challenge, but there are a number of challenges that must be overcome to allow their deployment in large numbers. Some of these challenges are technical (e.g. interference management and handover), but most are related to cost of deployment. The cost of backhaul figures prominently in this as current backhaul solutions, whether wireline technologies including optical fiber or LOS wireless used in macro cell backhaul, do not scale for small cell base stations. While a comprehensive look at the total cost of ownership for different backhaul solutions is not within the scope of this white paper, we will touch on some of the main costs related to planning and deployment as we will expand later in this paper on these two topics.

The cost of small cell wireless backhaul includes the cost of equipment, spectrum and recurring expenses such as power and lease costs for antennas. It also includes the cost of planning, design and deployment. These latter costs vary significantly between the different solutions and make a big difference in the ability of the network operator to roll out a large number of small cells rapidly. For example, a line-of-sight microwave system requires, as its name implies, a direct line-of-sight between the two nodes, which is difficult to achieve in urban areas because of buildings, trees and other structures. Moreover, LOS systems require two installation crews be present at the two ends for alignment purpose. The alignment process itself is lengthy and leads to additional financial burdens: for example, blocking a traffic lane during the installation process for a period exceeding a certain threshold (e.g. would require certain municipal licenses and municipal worker's presence on site, e.g. police or traffic coordinator). For these reasons, a new cost effective and scalable backhaul solution is required for small cells.

Non-line-of-sight (NLOS) wireless backhaul provides such a solution for cost-effective scalable small cell deployments. NLOS typically uses an OFDM physical layer (Orthogonal Frequency Division Multiplexing) that divides a wide-band frequency channel into many narrow-band sub-carriers. This result in high tolerance to multipath fading and the consequent wireless channel impairments in a manner not possible to achieve in LOS systems whose physical layer are based on a single wide-band carrier. NLOS solutions operate in low-cost licensed band TDD (Time Division Duplex) spectrum in the sub 6 GHz bands. The propagation conditions in such bands as 2.3, 2.6 and 3.5 GHz are very favorable to outdoor deployments in urban areas providing a fair trade-off between coverage range and capacity of the backhaul link. NLOS systems by definition allow operators to deploy systems anywhere a small cell is required. This is a great advantage since traffic can be highly localized which limits the options of locating a LOS small cell. Moreover, deploying NLOS system requires a single technician and one truck roll only to place a remote backhaul module on a pole or building side wall and orient it towards a best serving hub module.

The design of NLOS backhaul network is different from that of LOS microwave since detailed path analysis is no longer required. Rather, planning tools are used to provide an estimate of the performance at a location where small cell is desired. In this regard, NLOS backhaul is similarly planned to fixed wireless access service systems.

NLOS Wireless Backhaul Deployment Scenario

NLOS wireless backhaul network consists of a hub module (HM) and a remote backhaul module (RBM). The hub module connects to several RBMs in a point-to-multipoint configuration. The hub module is typically situated at a fiber point-of-presence or where high-capacity LOS microwave system is available to connect the hub to the core network. An existing macro-cell can be such a site. Typical height for a hub module in an urban area ranges between 25-40 meters above ground.

The hub modules are typically connected to a wide horizontal beam width antenna (65 or 90 degrees). Therefore, they have a relatively wide coverage and can connect to multiple RBMs. Multiple hubs can be located on the same site in a configuration similar to the macro-cellular network. For example, three or four hubs can be located on a building rooftop to serve the entire surroundings of the site. Figure 2 shows conceptually how the hub module is mounted on a building rooftop where fiber or LOS microwave backhaul to the core network is present. Multiple remote backhaul modules are connected wirelessly to the hub module in a point-to-multipoint configuration while they connect to the small cell base station over a Cat5 Ethernet cable.

Figure 2 NLOS wireless backhaul hub modules are mounted on building rooftop. Multiple remote backhaul modules connect to the hub module in point-to-multipoint configuration.

The remote backhaul module is co-located with the small cell base station on a pole (e.g. light pole, utility pole, etc.), building sidewall, or some other structure. Small cell base stations, and henceforth the RBMs, are typically located at 3-8 m in height. Therefore, the remote backhaul module is located below the roofline and typically, there would not be a clear line-of-sight to the hub module.

RBMs feature have a directional antenna which is pointed towards the best serving hub module. The directional antennas on RBMs serve to increase the system gain and to reduce interference by directing transmitted electromagnetic energy into the direction of the serving hub module. They also receive less interference from hub modules not located within their antenna boresight.

For the simulations presented in this white paper BLiNQ’s X100 NLOS wireless backhaul system with 83 Mbps peak capacity in 10 MHz channel is used. This is achieved with 256QAM 7/8 modulation in MIMO (multiple input multiple output) operation with two transmit and receive antennas in spatial multiplexing mode where two code words are transmitted simultaneously, one on each antenna. Lower capacity is achieved depending on the signal quality (as measured by carrier-to-noise plus interference ratio; CINR) and corresponding modulation coding scheme (MCS) selection.

System Gain and Path Loss

As in any wireless system, the system gain provides the allowable path loss between the transmitter and receiver. The system gain is a function of a number of parameters that include:

- Output power
- Transmit and receive antenna gain
- Receiver sensitivity (which is a function of channel bandwidth, noise figure of the receiver, and the signal-to-noise ratio at the desired modulation scheme)
- Specific features of the transmitter and receiver such as transmission and reception diversity.

The allowable path loss is the maximum propagation attenuation that a link can encounter without loss of communication. The path loss is inversely related to distance r from the transmitter ($\propto\ r^{-n}$) where n is the power decay factor (or path loss exponent). To find the maximum distance a receiver can be located away from the transmitter, the path loss is reduced by a 'fade margin' that accounts for the fading expected in the wireless channel.

Non-line-of-sight wireless backhaul solutions operate at too low a frequency (compared to classical broadband backhaul) to be impacted by rain, snow, or other natural conditions which impact the performance of LOS systems. However, in turn, NLOS systems are subject to shadow and small scale fading. Shadow fading is the result of the interaction with large objects such as buildings in surrounding environmental clutter that could be vastly different at two different locations having the same transmitter-receiver separation. Small scale fading is caused by the addition of multipath components (with different phases) and thus varies for small changes in location of the RBM. For a given RBM location, reflections off objects in motion will cause the small scale fade to vary with time. Hence, a proper fade margin must be accounted for in path loss calculations.

Shadow fading is referred to as log-normal shadowing and is fully characterized by a mean and a standard deviation which typically is about 9 dB for urban environment. For a given contour around a transmitter, shadow fading can be calculated for a certain probability of receiving a signal at that contour. The fraction of total area with connectivity (signal above threshold) is derived from the contour probability.

The amount of small scale fading depends on the wireless propagation channel which is impacted by the deployment scenario (height of antennas), surrounding environment (e.g. dense urban area) as well as by the type and parameters of the antenna system (e.g. beamwidth). Small scale fade margin is also related to the desired percentage of link availability. In small cell wireless backhaul, it's typically acceptable to have 99.9% link availability. We factored 4 dB of standard deviation for small scale fading in a typical NLOS small cell backhaul deployment scenario.

Table 2 shows an example of fade margin for path loss exponent of 4 and composite standard deviation of 9.85 dB estimated for the above deployment scenario in a dense urban area. Therefore, 32 dB of fade margin results in 99.9% probability of having connectivity at the contour around a transmitter which translates into 99.99% of total area within this contour of having connectivity.

Table 2 Fade margin for path loss exponent of 4 and standard deviation of 9.85.

Fade Margin (dB)	Contour Reliability	Area Reliability
14.2	85%	97.4%
16.2	90%	98.35%
25.4	99%	99.87%
32.4	99.9%	99.99%

Capacity, Coverage & Link Reliability

The system gain, fade margin and resulting path loss define the link performance from a capacity, link reliability and coverage perspective. Figure 3 shows that for a maximum system gain of 136 dB it is possible to achieve about 300 m coverage radius with 32 dB of fade margin which corresponds to the chosen link availability. The model used is that for an urban area at 3.5 GHz. Increasing the fade margin increases the link availability and reduces the maximum allowable path loss and consequently the distance between the transmitter and receiver. Selecting a modulation coding scheme with lower CINR requirements increases the system gain while it reduces the link capacity. However, this results in either larger distance, greater reliability or a combination of both.

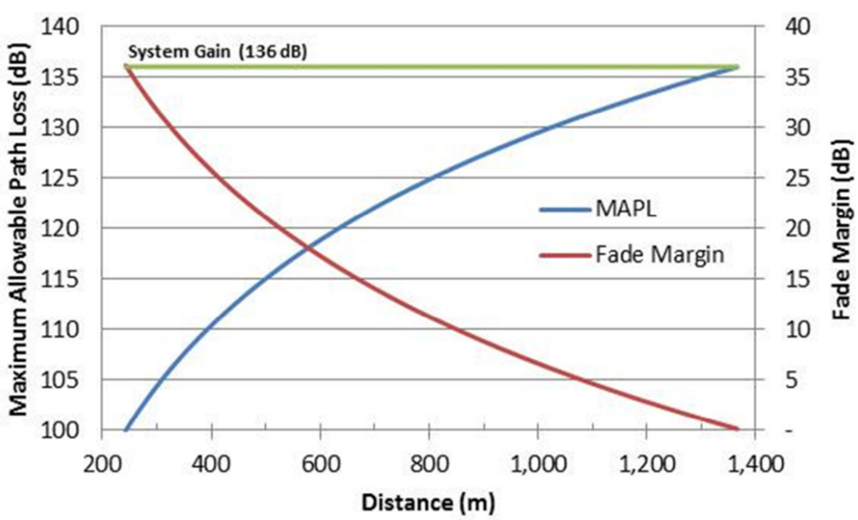


Figure 3 Trade-off between path loss and fade margin for a preset system gain.

Network Level Simulation & Planning

Having discussed the design of NLOS wireless backhaul conceptually, we like to outline the use of RF network planning tools in the design process. Network level simulations are necessary in the perspective of a large-scale introduction of small-cells. For the mobile user service coverage, the predictions are helpful for the characterization of the inter-cell interference, the evaluation of interference mitigation techniques, the evaluation of achievable capacity offloading and power consumption. For the wireless backhaul design, the simulations are paramount to predict the performance of the backhaul network especially in urban areas under NLOS conditions. Network level simulations also provide relevant inputs towards innovative business models for the equipment and the system.

SIRADEL extended usual radio-planning simulation tool capability and network design methodologies to assess small-cell deployment coverage and performance in addition to the NLOS backhaul component. An accurate description of a real environment (high-resolution geographical map data) and site-specific path-loss models allow for the prediction of NLOS areas, in-street canyoning effects and realistic outdoor-to-indoor propagation. In the remainder of the paper, we consider only the NLOS urban propagation loss estimation for the backhaul link (hub module and a remote backhaul module.) We do not use the simulation capabilities for links between the small cells and the mobile users. Before we present results for the backhaul link simulations, we discuss the tools available for NLOS small cell backhaul planning which center on two main elements: a. high resolution geographical data and b. path loss matrices.

Tools for NLOS Small Cell Backhaul Planning

Digital Geographical Data

RF coverage tools make use of digital descriptions of the geographical environment. This information allows us to place the transmitters at desired locations on a digital map, and to visualize the areas in which the signal reception can be observed. The geographical data also contains crucial information to predict the radio-wave propagation.

Geographical map data is composed of a set of distinct layers; each layer contains the description of one terrain characteristic such as geographical obstacle type (also called clutter or land usage), clutter height above ground, and ground altitude (or terrain elevation).

A pixel matrix (aka raster) layer is a collection of geo-localized rectangular pixel matrices; the value at each pixel may represent at one precise location a clutter type in a DLU (Digital Land Usage), a clutter height in a DHM (Digital Height Model), or an altitude in a DTM (Digital Terrain Model) or DEM (Digital Elevation Model).

A raster matrix with a resolution lower than 10 meters is generally referred to as HR (high resolution) matrix: it provides clear and precise contours of every single building, row of trees or small urban woods.

A clutter type may be represented by closed horizontal polygons that are vector data; sometimes the vector layer contains only building data but actually all clutter types can be represented (buildings, vegetation, bridges, and water). A 3D vector layer contains attributes that gives the clutter height associated with each of the above-mentioned vector polygons.

Figure 4 Vector data showing buildings, vegetation, and bridges in Paris, France.

Path-loss Matrices

The coverage simulations are obtained by predicting path-loss matrices, realized from the ray-based "Volcano" model developed by SIRADEL. This model generates multiple propagation paths in complex environments in reduced computation time. The method is based on separating the calculation of vertical propagation effects from lateral effects in a two-step process. In the first step, the lateral interactions of the radio wave with building façades (represented with 1m precision in a 3D vector database) give rise to multiple reflected and diffracted horizontal "rays." In the second step, a 3D ray trajectory is obtained by constructing an "unfolded profile," which contains all terrain obstacles found in the ray's vertical propagation plane (ground, building or vegetation). This information is extracted from the 3D vector database completed by a high-resolution terrain altitude grid (5 meters resolution in horizontal plane and 1 meter vertical precision). Losses are calculated from diffraction off the obstacles.

The Volcano tool gathers many heuristic parameters obtained from many years of engineering experience, thus the ray-based model is understood as pre-calibrated. Nevertheless the present work has benefited from a specific calibration, since a large amount of measurements were available in the study environment at the studied frequency.

Comparing NLOS to LOS System Availability in Urban Areas

One of the main purposes of using a RF coverage tool for NLOS small cell backhaul is to determine the availability of service in a specific location which is a key to reducing small cell deployment timeline and cost. The design process begins by identifying the location and height of the hub modules which are typically located at a fiber point-of-presence of where LOS microwave is available to connect the hub to the core network. Next, we completed simulations to obtain the coverage achieved from the hub locations over a relatively wide area for different small cell heights. The assumption is that the remote backhaul module would be placed at the same height as the small cell. Results of the simulations would provide a measure of expected backhaul performance over the area under simulations. The process is shown in Figure 5.

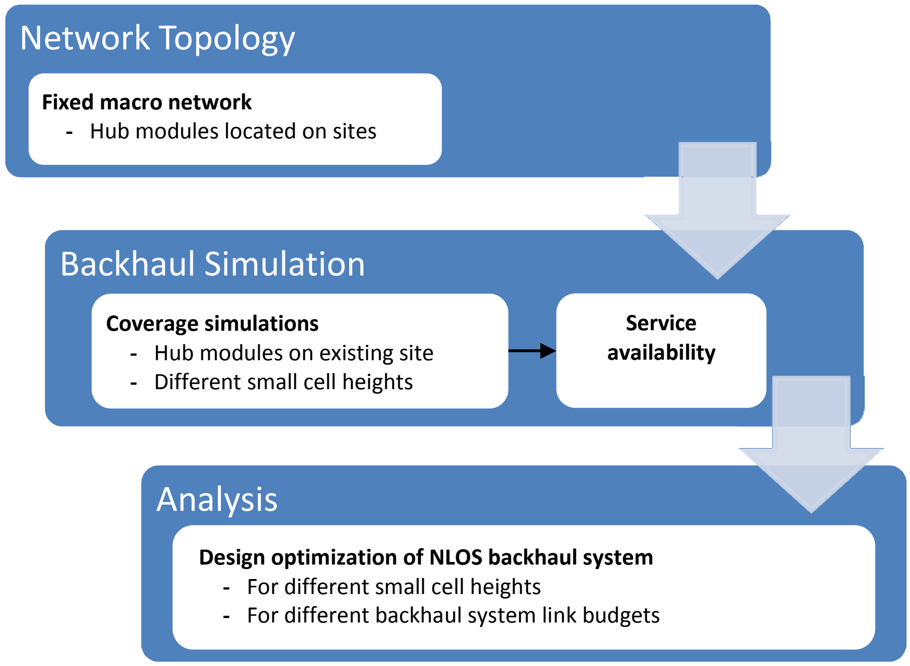


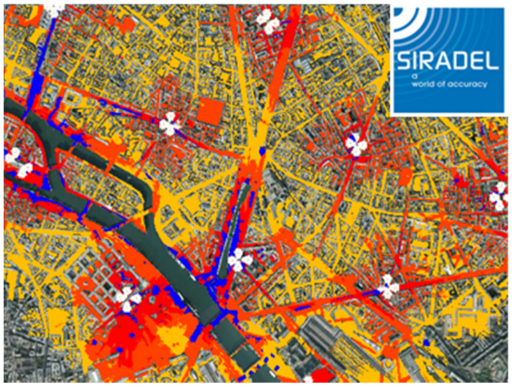
Figure 5 Simulation Synopsis.

Simulations were performed for a central area of Paris where small cell base stations were located at 5, 7, 10, 15 and 20m. The hub modules were placed at locations of existing macro-base stations with heights between 30m and 40m above ground. The average building height is 25m. The simulation parameters are given in Table 3.

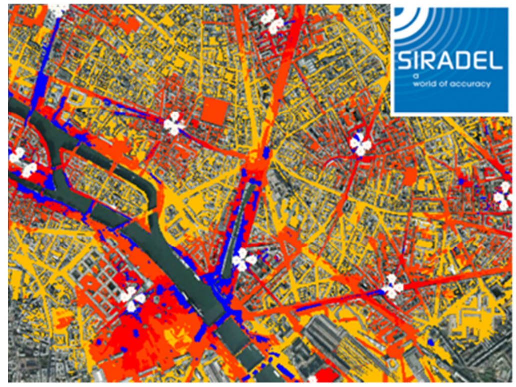
Table 3 Hub module & location properties

Sectorization	4 Sectors
Antenna	Horizontal aperture: 47°, Vertical Aperture: 7°
Antenna down-tilt	Depends on Macro BS height, SCBS height and MacroBS cell radius
Antenna height	3 meters above a dominant building rooftop
Antenna locations	At the edge of rooftop
Antenna gain	17 dBi
Tx Power	24 dBm
Tx EIRP	41 dBm

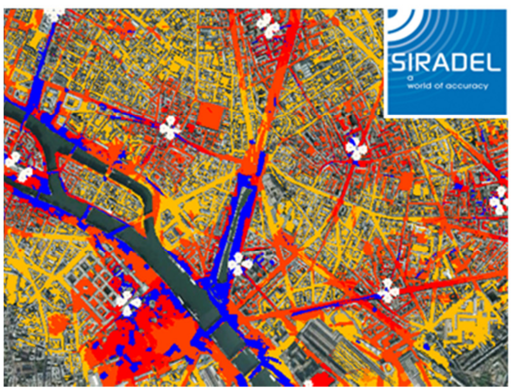
Figure 6 presents availability of service for the different small cell base stations heights (i.e. remote backhaul module height). Each map presents results for both LOS (28 GHz) and NLOS (3.5 GHz) backhaul systems for comparative purposes. It can be seen that the greater the height of the small cell, the greater the area over which a certain modulation scheme is achieved which results from lower path loss between the hub and remote backhaul modules.



a) Small cell height = 5m

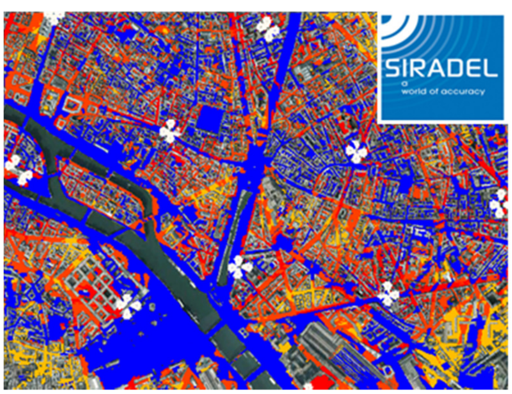


b) Small cell height = 7m



c) Small cell height = 10m

d) Small cell height = 15m



e) Small cell height = 20m

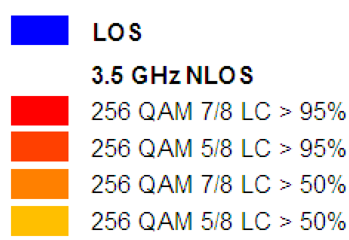


Figure 6 Availability of service for LOS and NLOS backhaul for different Small cell antenna heights: (a) 5m, (b) 7m, (c) 10m, (d) 15m, (e) 20m

Table 4 summarizes the availability of service for a NLOS system operating at 3.5 GHz for 256QAM 7/8 and 5/8 with 95% and 50% availability probability and LOS system at 28 GHz. It is important to state that this availability figure is that of “area” availability which is the probability that the signal will be of sufficient quality to establish a link at that location according to the corresponding modulation scheme. As expected, a greater probability for LOS service is possible for the higher small cell base station. But at typical SCBS height of 5 m, the probability of LOS achieving connectivity is only 5%. By comparison, NLOS system would be available in 95% of the area for 256QAM 5/8 modulation (which corresponds to 61 Mbps in a 10 MHz channel).

Table 4 Example of availability of service in dense urban area.

SCBS Height	3.5 GHz 256 QAM 5/8		3.5 GHz 256 QAM 7/8		LOS
	50%	95%	50%	95%	
5 m	87.1%	43.1%	45.9%	14.9%	5.0%
7 m	90.0%	46.7%	49.7%	16.7%	6.2%
10 m	91.1%	52.0%	55.3%	19.8%	9.9%
15 m	93.2%	65.1%	68.5%	26.6%	22.2%
20 m	96.8%	79.9%	82.8%	37.4%	51.6%

Conclusion

A cost effective backhaul solution is required to enable the business case for large scale small cell deployments. NLOS wireless backhaul is the solution that includes the low cost of equipment, the low cost spectrum which can be licensed on a block basis thereby resulting in diminishing marginal cost per added link, and the low cost of planning, installation and deployment. In this paper, we presented a solution by BLiNQ Networks that is optimized for NLOS small cell wireless backhaul. It operates in the sub 6 GHz licensed bands and allows operators to roll out small cell base stations with a single technician and truck roll for the deployment of the backhaul solution. The system can be deployed anywhere on light infrastructure assets in point-to-multipoint configuration which reduces total cost of ownership. The paper illustrates how NLOS wireless systems can be planned using SIRADEL’s high resolution geographic digital data and Volcano ray-based model which is optimized for accuracy and speed to calculate path loss. Simulations show that NLOS service in dense urban area such as in the city of Paris is available with very high probability even at relatively low heights (e.g. 43% of locations with 95% confidence at 5 m height for 256QAM 5/8) while building rooflines make connectivity for line-of-sight solutions challenging such that only 5% of locations would have a direct LOS at SCBS height of 5 m.

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SIRADEL is a high-tech company created in 1994 and based in France, China (Hong-Kong) and Canada (Toronto). The portfolio of the company is composed of:

- 3D GIS data and RF measurements
- Advanced RF Tools (Volcano, VolcanoLab)
- Management and Technology Consulting

SIRADEL serves more than 250 Customers in about 50 countries. SIRADEL's solution brings more reliable and realistic assessments of wireless network and wireless equipment performances. The key benefits for SIRADEL's partners are to significantly reduce the cost of radio infrastructures. The profile of its Customers is diverse: wireless carriers, radio access equipment manufacturer, regulation bodies, utilities, consultants.

BLiNQ Networks was founded in June 2010 after the acquisition of intellectual property and wireless assets from Nortel Networks. BLiNQ is a pioneer of wireless backhaul solutions that fundamentally change the way mobile operators deliver mobile broadband services in urban areas. BLiNQ uses cost-effective sub-6 GHz spectrum and unique and patent-pending Managed Adaptive Resource Allocation (MARA) technology to provide network-level intelligence, self-organizing network capabilities, and eliminate interference challenges to maximize spectral efficiency. BLiNQ is headquartered in Plano, TX with research and development facilities in Ottawa, Canada. For more information, please visit www.blinqnetworks.com.

Exhibit B

3650 MHz Feasibility Study
Operation within Grandfathered Earth Station Protection Zones

Introduction

The purpose of the study is to evaluate the potential for interference from planned 3650 MHz Wireless Broadband System (WBS) sites in the New York City and San Francisco markets that are within the grandfathered earth station protection zones described in FCC rule Part 90.1331. This study evaluates specific WBS station locations and their operating parameters with the grandfathered earth stations located within 150 km. The intent of this feasibility study is to provide engineering support to obtain approval from the earth station licensee(s) for operation of the WBS sites, should the results indicate no predictable interference is expected.

Discussion and Results

The following results summarize our evaluation of the interference scenario between the WBS sites and the grandfathered earth stations that share the 3650 to 3700 MHz band segment and are within 150 km. Our methodology is based on well established calculations that have been used in the coordination process between earth stations and terrestrial microwave stations for many years. These calculations involve conducting terrain profiles between each WBS transmitter site and each licensed earth station, and computing the over-the-horizon loss (OH loss) predicted due to the intervening terrain. Using the operating parameters of the WBS transmitter sites and the earth stations, we can then calculate predicted signal strengths at the earth station location and compare these signal levels against the earth station's interference objectives.

Input parameters

The table below summarizes the input parameters for the WBS system in each market. Note that we are assuming the maximum allowable EIRP of 1 Watt per MHz as designated in FCC rule part 90.1321 for each WBS transmitter. We used the coordinates, ground elevations and antenna heights provided by BlinQ Networks for sites in New York and San Francisco.

WBS Station	WBS Lat (Deg)	WBS Lat (Min)	WBS Lat (Sec)	WBS Lon (Deg)	WBS Lon (Min)	WBS Lon (Sec)	WBS Grnd. Elev. (m)	WBS Ant C/L (m)
NYC HM	40	45	33.78	73	59	11.94	14.3	40.00
NYC RBM1	40	45	36.35	73	59	2.65	16.0	10.00
NYC RBM2	40	45	29.98	73	59	2.63	15.6	10.00
NYC RBM3	40	45	23.00	73	59	6.44	17.3	10.00
NYC RBM4	40	45	23.39	73	59	12.68	16.1	10.00
NYC RBM5	40	45	26.57	73	59	24.39	12.7	10.00
NYC RBM6	40	45	33.08	73	59	18.28	13.1	10.00

WBS Station	WBS Lat (Deg)	WBS Lat (Min)	WBS Lat (Sec)	WBS Lon (Deg)	WBS Lon (Min)	WBS Lon (Sec)	WBS Grnd. Elev. (m)	WBS Ant C/L (m)
SF HM	37	46	56.01	122	24	34.92	11.8	40.00
SF RBM1	37	46	54.07	122	24	22.88	8.8	10.00
SF RBM2	37	46	53.01	122	24	31.40	10.5	10.00
SF RBM3	37	46	56.70	122	24	43.64	14.5	10.00
SF RBM4	37	46	59.95	122	24	39.45	14.0	10.00
SF RBM5	37	47	3.82	122	24	33.37	14.7	10.00
SF RBM6	37	46	59.30	122	24	32.07	12.7	10.00

Table 1: WBS parameters

Figure 1 shows a map of the grandfathered earth station locations identified within 150 km of the NYC HM WBS site (orange marker) in Table 1. Earth station facilities were identified in Carteret, NJ licensed to All Mobile Video (2 stations), Hauppauge, NY licensed to Globecomm and Reuters, Carpentersville, NJ licensed to Lockheed Martin, and Franklin, NJ licensed to Sprint.

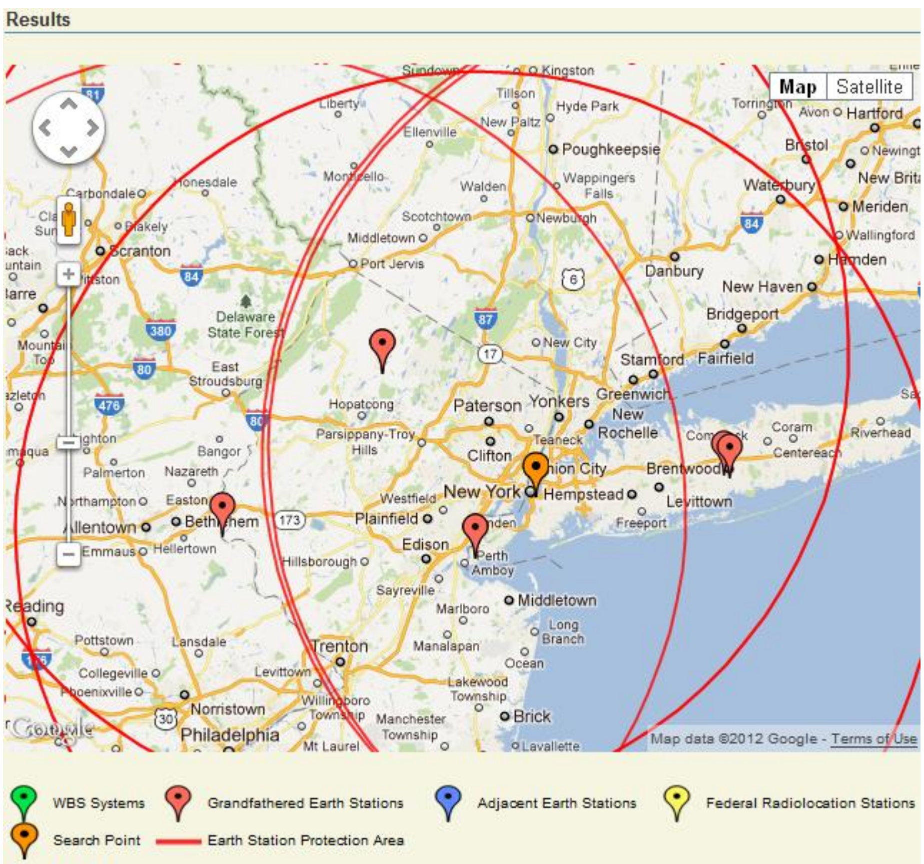

Figure 1: Map of Grandfathered Earth Stations within 150 km of NYC HM

Figure 2 shows a map of the grandfathered earth station locations identified within 150 km of the SF HM WBS site (orange marker) in Table 1. Earth station facilities were identified in Mtn House, CA licensed to Pacific Satellite (2 stations), Livermore and San Ramon, CA licensed to Sprint (2 stations) and Salt Creek, CA licensed to Xaba Ranch, LLC (3 stations).

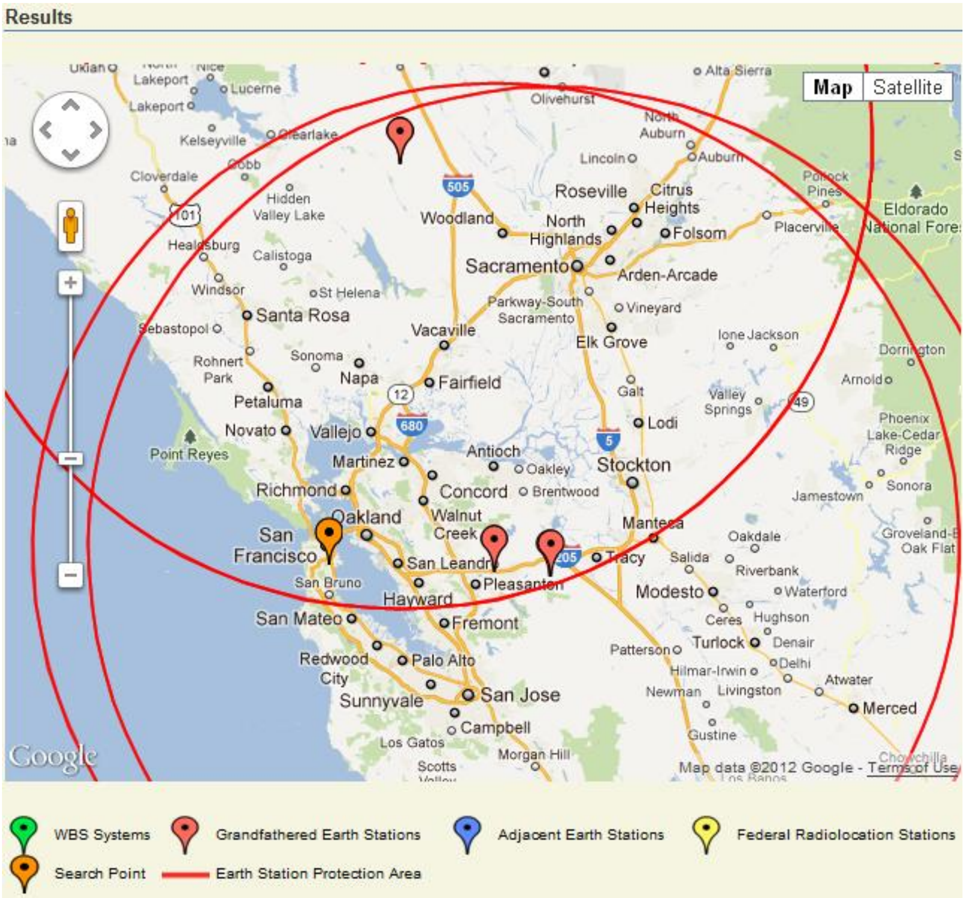

Figure 2: Map of Grandfathered Earth Stations within 150 km of SF HM

Table 2 details the grandfathered earth station locations.

Licensee	Site	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)
All Mobile Video	Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8
All Mobile Video	Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5
Globecomm	Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49
Globecomm	Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49
Lockheed	Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1
Reuters America	Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96
Reuters America	Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96
Sprint	Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97
Sprint	Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13

Licensee	Site	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)
Pacific Satellite	Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0
Pacific Satellite	Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3
Sprint	Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0
Sprint	San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7
Sprint	San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7
Xaba Ranch	Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.67
Xaba Ranch	Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.67
Xaba Ranch	Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.67

Table 2: Grandfathered Earth Station parameters

Summary of Results

Based on the inputs identified in the table above, Table 3 below summarizes the calculated signal strengths into the earth stations from each WBS site. Note that we have assumed the FCC maximum EIRP of 1 Watt / MHz for each WBS site. Additional advantage could be gained from using antenna discrimination of the specific antennas at each WBS site.

The LOS Interference Level column indicates the predicted signal strength without consideration of the intervening terrain. The OH loss columns indicate a 20% and 0.01% value for each calculation that account for the long-term and short-term predicted losses above free space. These long-term and short-term OH losses are then compared to the earth station's long-term and short-term interference objectives and the resulting margins are indicated in the tables. A positive margin indicates that the interference objective is met and there is no predictable interference, while a negative margin value indicates that the interference objective is not met and there is a potential for interference.

As shown in Tables 3 and 4 below, all cases into the earth station facilities meet the earth station interference objectives except for some of the New York City sites into the Carteret, NJ (AMV) and Hauppauge, NY (Globecomm) earth stations. The full results are given in the accompanying spreadsheets 'NY calcs' and 'SF calcs', and the files 'NY OH loss calcs' and 'SF OH loss calcs'.

The unresolved cases into AMV's Carteret, NJ earth stations are mainly due to the very close proximity of the New York City WBS sites (only about 28 km away). Any increase in the antenna heights would bring all of these cases closer to a line-of-sight (LOS) condition. Of course, the presence of buildings or other clutter would mitigate the interference potential.

The cases into the Hauppauge, NY earth station (Globecomm) barely miss the short-term objective by less than ½ of a dB. These would typically be considered clear due to the conservative nature of the OH loss calculations and the presence of other clutter (trees, buildings, etc.) that would help reduce the predicted signal strength.

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8	NYC HM	27.92	44.11	0.00	132.67	-10.30	-142.97	-156.00	-146.00	8.60	3.50	-4.43	0.47	Unresolved
Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8	NYC RBM1	28.13	44.32	0.00	132.74	-10.30	-143.04	-156.00	-146.00	28.10	22.90	15.14	19.94	Clear
Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8	NYC RBM2	27.99	44.60	0.00	132.70	-10.30	-143.00	-156.00	-146.00	25.30	20.20	12.30	17.20	Clear
Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8	NYC RBM3	27.78	44.78	0.00	132.63	-10.30	-142.93	-156.00	-146.00	24.80	19.70	11.73	16.63	Clear
Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8	NYC RBM4	27.68	44.55	0.00	132.60	-10.30	-142.90	-156.00	-146.00	25.10	20.00	12.00	16.90	Clear
Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8	NYC RBM5	27.56	44.00	0.00	132.56	-10.30	-142.86	-156.00	-146.00	24.90	19.80	11.76	16.66	Clear
Carteret	E950361	40	34	44.7	74	13	0.5	5.2	4.8	NYC RBM6	27.80	43.92	0.00	132.64	-10.30	-142.94	-156.00	-146.00	24.50	19.40	11.44	16.34	Clear
Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5	NYC HM	27.89	44.11	0.00	132.66	-13.90	-146.56	-156.00	-146.00	-1.40	-3.60	-10.84	-3.04	Unresolved
Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5	NYC RBM1	28.10	44.31	0.00	132.73	-13.90	-146.63	-156.00	-146.00	24.80	19.70	15.43	20.33	Clear
Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5	NYC RBM2	27.96	44.60	0.00	132.69	-13.90	-146.59	-156.00	-146.00	16.30	11.20	6.89	11.79	Clear
Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5	NYC RBM3	27.74	44.78	0.00	132.62	-13.90	-146.52	-156.00	-146.00	16.10	11.00	6.62	11.52	Clear
Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5	NYC RBM4	27.65	44.55	0.00	132.59	-13.90	-146.49	-156.00	-146.00	24.70	19.60	15.19	20.09	Clear
Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5	NYC RBM5	27.53	44.00	0.00	132.55	-13.90	-146.45	-156.00	-146.00	17.00	-0.10	7.45	0.35	Clear
Carteret	E950372	40	34	45.4	74	12	59.5	5.18	5.5	NYC RBM6	27.77	43.92	0.00	132.63	-13.90	-146.53	-156.00	-146.00	27.20	22.10	17.73	22.63	Clear

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49	NYC HM	63.45	264.67	0.00	139.80	-10.00	-149.80	-156.00	-146.00	57.50	15.30	51.30	19.10	Clear
Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM1	63.23	264.72	0.00	139.77	-10.00	-149.77	-156.00	-146.00	57.20	12.80	50.97	16.57	Clear
Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM2	63.25	264.54	0.00	139.78	-10.00	-149.78	-156.00	-146.00	57.30	12.90	51.08	16.68	Clear
Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM3	63.36	264.36	0.00	139.79	-10.00	-149.79	-156.00	-146.00	57.20	12.80	50.99	16.59	Clear
Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM4	63.50	264.38	0.00	139.81	-10.00	-149.81	-156.00	-146.00	57.20	12.80	51.01	16.61	Clear
Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM5	63.77	264.50	0.00	139.85	-10.00	-149.85	-156.00	-146.00	57.30	12.90	51.15	16.75	Clear
Hauppauge	E970361a	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM6	63.60	264.66	0.00	139.82	-10.00	-149.82	-156.00	-146.00	57.30	12.90	51.12	16.72	Clear
Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49	NYC HM	63.45	264.67	0.00	139.80	6.80	-133.00	-156.00	-146.00	57.50	15.30	34.50	2.30	Clear
Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM1	63.23	264.72	0.00	139.77	6.79	-132.98	-156.00	-146.00	57.20	12.80	34.18	-0.22	Unresolved
Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM2	63.25	264.54	0.00	139.78	6.82	-132.95	-156.00	-146.00	57.30	12.90	34.25	-0.15	Unresolved
Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM3	63.36	264.36	0.00	139.79	6.85	-132.94	-156.00	-146.00	57.20	12.80	34.14	-0.26	Unresolved
Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM4	63.50	264.38	0.00	139.81	6.85	-132.96	-156.00	-146.00	57.20	12.80	34.16	-0.24	Unresolved
Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM5	63.77	264.50	0.00	139.85	6.83	-133.02	-156.00	-146.00	57.30	12.90	34.32	-0.08	Unresolved
Hauppauge	E970361b	40	48	53.6	73	14	18.4	31.09	5.49	NYC RBM6	63.60	264.66	0.00	139.82	6.80	-133.02	-156.00	-146.00	57.30	12.90	34.32	-0.08	Unresolved

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1	NYC HM	102.59	82.45	0.00	143.98	-0.48	-144.45	-156.00	-146.00	64.90	19.60	53.35	18.05	Clear
Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1	NYC RBM1	102.81	82.42	0.00	144.00	-0.49	-144.49	-156.00	-146.00	66.00	21.10	54.49	19.59	Clear
Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1	NYC RBM2	102.79	82.53	0.00	143.99	-0.44	-144.43	-156.00	-146.00	65.80	20.90	54.23	19.33	Clear
Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1	NYC RBM3	102.68	82.64	0.00	143.98	-0.38	-144.36	-156.00	-146.00	65.50	20.50	53.86	18.86	Clear
Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1	NYC RBM4	102.53	82.63	0.00	143.97	-0.39	-144.36	-156.00	-146.00	65.70	20.70	54.06	19.06	Clear
Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1	NYC RBM5	102.27	82.55	0.00	143.95	-0.42	-144.37	-156.00	-146.00	66.10	21.20	54.47	19.57	Clear
Carpentersvi	E7541	40	38	39.4	75	11	27.6	54.86	9.1	NYC RBM6	102.44	82.45	0.00	143.96	-0.47	-144.44	-156.00	-146.00	66.20	21.30	54.64	19.74	Clear

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96	NYC HM	61.42	263.85	0.00	139.52	-10.00	-149.52	-156.00	-146.00	58.40	16.30	51.92	19.82	Clear
Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM1	61.20	263.90	0.00	139.49	-10.00	-149.49	-156.00	-146.00	58.20	14.30	51.69	17.79	Clear
Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM2	61.22	263.71	0.00	139.49	-10.00	-149.49	-156.00	-146.00	58.20	14.30	51.69	17.79	Clear
Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM3	61.33	263.52	0.00	139.51	-10.00	-149.51	-156.00	-146.00	58.00	13.70	51.51	17.21	Clear
Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM4	61.48	263.55	0.00	139.53	-10.00	-149.53	-156.00	-146.00	58.00	13.70	51.53	17.23	Clear
Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM5	61.74	263.67	0.00	139.57	-10.00	-149.57	-156.00	-146.00	58.10	13.80	51.67	17.37	Clear
Hauppauge	E950436a	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM6	61.57	263.84	0.00	139.54	-10.00	-149.54	-156.00	-146.00	58.10	13.80	51.64	17.34	Clear
Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96	NYC HM	61.42	263.85	0.00	139.52	-10.00	-149.52	-156.00	-146.00	58.40	16.30	51.92	19.82	Clear
Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM1	61.20	263.90	0.00	139.49	-10.00	-149.49	-156.00	-146.00	58.20	14.30	51.69	17.79	Clear
Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM2	61.22	263.71	0.00	139.49	-10.00	-149.49	-156.00	-146.00	58.20	14.30	51.69	17.79	Clear
Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM3	61.33	263.52	0.00	139.51	-10.00	-149.51	-156.00	-146.00	58.00	13.70	51.51	17.21	Clear
Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM4	61.48	263.55	0.00	139.53	-10.00	-149.53	-156.00	-146.00	58.00	13.70	51.53	17.23	Clear
Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM5	61.74	263.67	0.00	139.57	-10.00	-149.57	-156.00	-146.00	58.10	13.80	51.67	17.37	Clear
Hauppauge	E950436b	40	49	15.4	73	15	48.4	49.69	3.96	NYC RBM6	61.57	263.84	0.00	139.54	-10.00	-149.54	-156.00	-146.00	58.10	13.80	51.64	17.34	Clear

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97	NYC HM	63.59	128.57	0.00	139.82	1.17	-138.66	-156.00	-146.00	80.20	38.60	62.86	31.26	Clear
Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97	NYC RBM1	63.71	128.39	0.00	139.84	1.24	-138.60	-156.00	-146.00	80.70	37.60	63.30	30.20	Clear
Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97	NYC RBM2	63.83	128.52	0.00	139.86	1.18	-138.67	-156.00	-146.00	80.70	37.50	63.37	30.17	Clear
Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97	NYC RBM3	63.90	128.73	0.00	139.86	1.10	-138.77	-156.00	-146.00	80.20	37.50	62.97	30.27	Clear
Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97	NYC RBM4	63.78	128.80	0.00	139.85	1.07	-138.78	-156.00	-146.00	80.30	37.60	63.08	30.38	Clear
Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97	NYC RBM5	63.50	128.89	0.00	139.81	1.03	-138.78	-156.00	-146.00	80.50	37.60	63.28	30.38	Clear
Franklin	KA231	41	7	4.3	74	34	31.6	207.26	10.97	NYC RBM6	63.49	128.67	0.00	139.81	1.12	-138.68	-156.00	-146.00	80.40	37.50	63.08	30.18	Clear
Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13.00	NYC HM	63.59	128.57	0.00	139.82	-1.55	-141.37	-156.00	-146.00	80.10	38.70	65.47	34.07	Clear
Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13.00	NYC RBM1	63.71	128.39	0.00	139.84	-1.49	-141.33	-156.00	-146.00	80.50	37.60	65.83	32.93	Clear
Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13.00	NYC RBM2	63.83	128.52	0.00	139.86	-1.53	-141.39	-156.00	-146.00	79.70	36.60	65.09	31.99	Clear
Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13.00	NYC RBM3	63.90	128.73	0.00	139.86	-1.60	-141.46	-156.00	-146.00	80.10	37.60	65.56	33.06	Clear
Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13.00	NYC RBM4	63.78	128.80	0.00	139.85	-1.62	-141.47	-156.00	-146.00	80.20	37.70	65.67	33.17	Clear
Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13.00	NYC RBM5	63.50	128.89	0.00	139.81	-1.65	-141.46	-156.00	-146.00	80.40	37.70	65.86	33.16	Clear
Franklin	E6777	41	7	4.3	74	34	31.6	207.3	13.00	NYC RBM6	63.49	128.67	0.00	139.81	-1.58	-141.39	-156.00	-146.00	80.30	37.60	65.69	32.99	Clear

Table 3: Calculated results into grandfathered earth stations for NYC WBS sites

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0	SF HM	53.85	272.69	0.00	138.38	-1.19	-139.57	-156.00	-144.00	69.10	28.10	52.67	23.67	Clear
Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0	SF RBM1	53.55	272.64	0.00	138.33	-1.17	-139.50	-156.00	-144.00	68.50	25.20	52.00	20.70	Clear
Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0	SF RBM2	53.76	272.60	0.00	138.36	-1.15	-139.51	-156.00	-144.00	68.50	25.20	52.01	20.71	Clear
Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0	SF RBM3	54.06	272.70	0.00	138.41	-1.19	-139.61	-156.00	-144.00	68.30	25.00	51.91	20.61	Clear
Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0	SF RBM4	53.96	272.82	0.00	138.40	-1.24	-139.64	-156.00	-144.00	68.50	25.20	52.14	20.84	Clear
Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0	SF RBM5	53.82	272.95	0.00	138.37	-1.30	-139.68	-156.00	-144.00	68.60	25.40	52.28	21.08	Clear
Livermore	KA232	37	45	39.7	121	47	56.8	230.43	3.0	SF RBM6	53.78	272.80	0.00	138.37	-1.24	-139.61	-156.00	-144.00	68.50	25.20	52.11	20.81	Clear
San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF HM	53.85	272.69	0.00	138.38	3.39	-134.99	-156.00	-146.00	68.70	28.90	47.69	17.89	Clear
San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM1	53.55	272.64	0.00	138.33	3.43	-134.90	-156.00	-146.00	67.80	25.20	46.70	14.10	Clear
San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM2	53.76	272.60	0.00	138.36	3.46	-134.90	-156.00	-146.00	67.90	25.20	46.80	14.10	Clear
San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM3	54.06	272.70	0.00	138.41	3.38	-135.04	-156.00	-146.00	67.70	24.90	46.74	13.94	Clear
San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM4	53.96	272.82	0.00	138.40	3.29	-135.10	-156.00	-146.00	67.90	25.20	47.00	14.30	Clear
San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM5	53.82	272.95	0.00	138.37	3.19	-135.18	-156.00	-146.00	68.10	25.40	47.28	14.58	Clear
San Ramon 1	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM6	53.78	272.80	0.00	138.37	3.30	-135.07	-156.00	-146.00	67.90	25.20	46.97	14.27	Clear
San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF HM	53.85	272.69	0.00	138.38	-10.00	-148.38	-156.00	-146.00	68.70	28.90	61.08	31.28	Clear
San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM1	53.55	272.64	0.00	138.33	-10.00	-148.33	-156.00	-146.00	67.80	25.20	60.13	27.53	Clear
San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM2	53.76	272.60	0.00	138.36	-10.00	-148.36	-156.00	-146.00	67.90	25.20	60.26	27.56	Clear
San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM3	54.06	272.70	0.00	138.41	-10.00	-148.41	-156.00	-146.00	67.70	24.90	60.11	27.31	Clear
San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM4	53.96	272.82	0.00	138.40	-10.00	-148.40	-156.00	-146.00	67.90	25.20	60.30	27.60	Clear
San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM5	53.82	272.95	0.00	138.37	-10.00	-148.37	-156.00	-146.00	68.10	25.40	60.47	27.77	Clear
San Ramon 2	E6241	37	45	39.7	121	47	56.8	236.2	6.7	SF RBM6	53.78	272.80	0.00	138.37	-10.00	-148.37	-156.00	-146.00	67.90	25.20	60.27	27.57	Clear

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.7	SF HM	130.41	190.19	0.00	146.06	-9.23	-155.29	-150.00	-130.00	78.10	34.40	83.39	59.69	Clear
Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.7	SF RBM1	130.42	190.06	0.00	146.06	-9.24	-155.31	-150.00	-130.00	78.40	36.90	83.71	62.21	Clear
Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.7	SF RBM2	130.49	190.15	0.00	146.07	-9.24	-155.30	-150.00	-130.00	80.30	38.90	85.60	64.20	Clear
Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.7	SF RBM3	130.43	190.29	0.00	146.06	-9.22	-155.28	-150.00	-130.00	84.80	43.40	90.08	68.68	Clear
Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.7	SF RBM4	130.31	190.25	0.00	146.05	-9.22	-155.28	-150.00	-130.00	84.40	42.90	89.68	68.18	Clear
Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.7	SF RBM5	130.17	190.19	0.00	146.05	-9.23	-155.28	-150.00	-130.00	81.50	40.00	86.78	65.28	Clear
Salt Creek 3	KA371	38	56	19.8	122	8	51.9	176.78	10.7	SF RBM6	130.30	190.17	0.00	146.05	-9.23	-155.29	-150.00	-130.00	80.80	39.30	86.09	64.59	Clear
Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.7	SF HM	130.43	190.18	0.00	146.06	-9.23	-155.29	-150.00	-130.00	77.40	33.80	82.69	59.09	Clear
Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.7	SF RBM1	130.44	190.05	0.00	146.06	-9.25	-155.31	-150.00	-130.00	77.70	36.30	83.01	61.61	Clear
Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.7	SF RBM2	130.51	190.13	0.00	146.07	-9.24	-155.30	-150.00	-130.00	79.70	38.30	85.00	63.60	Clear
Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.7	SF RBM3	130.45	190.27	0.00	146.06	-9.22	-155.29	-150.00	-130.00	84.30	42.90	89.59	68.19	Clear
Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.7	SF RBM4	130.33	190.24	0.00	146.06	-9.23	-155.28	-150.00	-130.00	83.90	42.50	89.18	67.78	Clear
Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.7	SF RBM5	130.19	190.18	0.00	146.05	-9.23	-155.28	-150.00	-130.00	81.00	39.50	86.28	64.78	Clear
Salt Creek 1	KA372	38	56	20.6	122	8	53.1	176.78	10.7	SF RBM6	130.32	190.16	0.00	146.06	-9.23	-155.29	-150.00	-130.00	80.20	38.70	85.49	63.99	Clear
Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.7	SF HM	130.47	190.17	0.00	146.07	-9.23	-155.30	-150.00	-130.00	74.30	30.70	79.60	56.00	Clear
Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.7	SF RBM1	130.48	190.04	0.00	146.07	-9.25	-155.31	-150.00	-130.00	75.60	34.10	80.91	59.41	Clear
Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.7	SF RBM2	130.54	190.13	0.00	146.07	-9.24	-155.31	-150.00	-130.00	76.90	35.50	82.21	60.81	Clear
Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.7	SF RBM3	130.48	190.26	0.00	146.07	-9.22	-155.29	-150.00	-130.00	82.00	40.60	87.29	65.89	Clear
Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.7	SF RBM4	130.37	190.23	0.00	146.06	-9.23	-155.29	-150.00	-130.00	81.60	40.20	86.89	65.49	Clear
Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.7	SF RBM5	130.22	190.17	0.00	146.05	-9.23	-155.28	-150.00	-130.00	78.30	36.90	83.58	62.18	Clear
Salt Creek 2	KA373	38	56	21.9	122	8	53.5	176.78	10.7	SF RBM6	130.36	190.15	0.00	146.06	-9.24	-155.29	-150.00	-130.00	77.50	36.10	82.79	61.39	Clear

Earth Station	Call Sign	ES Lat (Deg)	ES Lat (Min)	ES Lat (Sec)	ES Lon (Deg)	ES Lon (Min)	ES Lon (Sec)	ES Grnd. Elev. (m)	ES Ant C/L (m)	WBS Station	ES to WBS Dist. (km)	ES to WBS Azimuth (deg)	WBS EIRP (dBW/ MHz)	FS Loss (dB)	ES Horiz. Gain toward WBS (dBi)	LOS Interf. Level (dBW/ MHz)	Obj. 20% (dBW/ MHz)	Obj. 0.01% (dBW/ MHz)	OH Loss 20% (dB)	OH Loss 0.01% (dB)	Margin 20% (dB)	Margin 0.01% (dB)	Result
Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0	SF HM	71.95	273.06	0.00	140.90	-10.00	-150.90	-150.00	-140.00	59.80	50.20	60.70	61.10	Clear
Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0	SF RBM1	71.65	273.02	0.00	140.86	-10.00	-150.86	-150.00	-140.00	66.90	22.30	67.76	33.16	Clear
Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0	SF RBM2	71.86	272.99	0.00	140.88	-10.00	-150.88	-150.00	-140.00	67.00	22.40	67.88	33.28	Clear
Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0	SF RBM3	72.16	273.07	0.00	140.92	-10.00	-150.92	-150.00	-140.00	66.90	22.20	67.82	33.12	Clear
Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0	SF RBM4	72.07	273.15	0.00	140.91	-10.00	-150.91	-150.00	-140.00	66.90	22.30	67.81	33.21	Clear
Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0	SF RBM5	71.92	273.25	0.00	140.89	-10.00	-150.89	-150.00	-140.00	67.30	22.70	68.19	33.59	Clear
Mtn House 1	KA86	37	45	1.7	121	35	38.8	128.02	7.0	SF RBM6	71.88	273.14	0.00	140.89	-10.00	-150.89	-150.00	-140.00	66.90	22.30	67.79	33.19	Clear
Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3	SF HM	71.98	273.08	0.00	140.90	3.35	-137.55	-156.00	-146.00	59.90	50.20	41.45	41.75	Clear
Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3	SF RBM1	71.68	273.04	0.00	140.86	3.38	-137.49	-156.00	-146.00	66.90	22.30	48.39	13.79	Clear
Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3	SF RBM2	71.89	273.01	0.00	140.89	3.40	-137.49	-156.00	-146.00	67.00	22.40	48.49	13.89	Clear
Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3	SF RBM3	72.19	273.09	0.00	140.92	3.34	-137.58	-156.00	-146.00	60.00	50.40	41.58	41.98	Clear
Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3	SF RBM4	72.09	273.17	0.00	140.91	3.28	-137.63	-156.00	-146.00	60.80	51.10	42.43	42.73	Clear
Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3	SF RBM5	71.95	273.27	0.00	140.90	3.21	-137.69	-156.00	-146.00	67.10	22.60	48.79	14.29	Clear
Mtn House	KA206	37	45	0.7	121	35	37.8	125.88	8.3	SF RBM6	71.91	273.16	0.00	140.89	3.29	-137.60	-156.00	-146.00	60.30	50.60	41.90	42.20	Clear

Table 4: Calculated results into grandfathered earth stations for San Francisco WBS sites

Conclusion

Based on the interference prediction methods described in this study and the input parameters assumed, potential interference is predicted only from a couple of the New York City sites into the Carteret, NJ earth stations licensed to All Mobile Video. The remaining cases into the other New York area grandfathered earth stations, and the stations in the San Francisco area all meet the interference objectives based on the LOS interference level calculated and the OH losses computed using the path profiles of intervening terrain between the WBS transmitter sites and these earth stations.

This analysis is valid for only the sites studied at the parameters assumed (ground elevations, antenna heights, etc.) Other locations in the market areas may not have similar terrain obstructions to these earth station facilities. Please also be aware that since the FCC did not mandate a specific coordination process or provide guidelines for interference mitigation, there is no guarantee that the earth station licensee will agree to your operations, even if no predictable interference is expected based on our results.